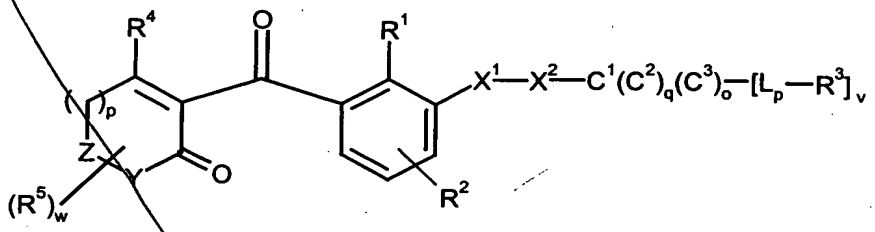
Patent claims AGR 2000/M 227 USA

1. A compound of the formula (I) or a salt thereof



(I)

in which

X^1 is a divalent unit selected from the group consisting of O, $S(O)_n$, NH, $N[L_p - R^3]$;

X^2 is a straight-chain or branched (C_1-C_6)-alkylene, (C_2-C_6)-alkenylene or (C_2-C_6)-alkynylene chain which is substituted by w halogen atoms and by k radicals $[L_p-R^3]$;

$C^1(C^2)_q(C^3)_o$ is a mono-, bi- or tricyclic radical, where

e) the rings C^1, C^2 and C^3 are in each case a 3- to 8-membered, saturated or partially saturated ring selected from the group consisting of cycloalkyl, cycloalkenyl, oxiranyl and oxetanyl,

f) the rings C^1, C^2 and C^3 are in each case linked to each other via one or two joint atoms;

R^1 and R^2 independently of one another are hydrogen, mercapto, nitro, cyano, halogen, thiocyanato, (C_1-C_6)-alkyl-CO-O, (C_1-C_6)-alkyl-$S(O)_n$-O, (C_1-C_6)-alkyl-$S(O)_n$, di-(C_1-C_6)-alkyl-NH-SO_2, (C_1-C_6)-alkyl-SO_2-NH, (C_1-C_6)-alkyl-NH-CO, (C_1-C_6)-alkyl-SO_2-[(C_1-C_6)-alkyl]amino, (C_1-C_6)-alkyl-CO-((C_1-C_6)-alkyl)amino, 1,2,4-triazol-1-yl, (C_1-C_6)-alkyl-O-CH_2, (C_1-C_6)-alkyl-$S(O)_n$-CH_2, (C_1-C_6)-alkyl-NH-CH_2, [(C_1-C_6)-alkyl]$_2$N-CH_2, 1,2,4-triazol-1-yl-CH_2, or are (C_1-C_6)-alkyl-$(D)_p$, (C_2-C_6)-alkenyl-$(D)_p$,

(C_2-C_6)-alkynyl-$(D)_p$, (C_3-C_9)-cycloalkyl-$(D)_p$, (C_3-C_9)-cycloalkenyl-$(D)_p$, (C_1-C_6)-alkyl-(C_3-C_9)-cycloalkyl-$(D)_p$ or (C_1-C_6)-alkyl-(C_3-C_9)-cycloalkenyl-$(D)_p$, each of which is substituted by v radicals selected from the group consisting of cyano, nitro and halogen;

R^3 is hydrogen, hydroxyl, halogen, mercapto, amino, nitro, a carbon-containing radical or, if p in X^1 is zero, R^3 is oxo, NR^8, $N\text{-}OR^8$ or $N\text{-}NR^8R^9$;

D is oxygen or sulfur;

L is in each case straight-chain or branched $A_p\text{-}[C(R^6)_2]_w\text{-}[A_p\text{-}C(R^6)_2]_x\text{-}A_p$ or $A_p\text{-}M\text{-}A_p$;

with the proviso that 2 or 3 of the variable terms p, w and x shall not simultaneously be zero;

A is a divalent unit selected from the group consisting of O, $S(O)_n$, NH, N-(C_1-C_6)-alkyl, N-(C_2-C_6)-alkenyl and N-(C_2-C_6)-alkynyl;

M is (C_1-C_6)-alkylene, (C_2-C_6)-alkenylene or (C_2-C_6)-alkynylene, each of which is substituted by w radicals R^6;

R^4 is OR^7, (C_1-C_4)-alkylthio, halo-(C_1-C_4)-alkylthio, (C_1-C_4)-alkenylthio, halo-(C_2-C_4)-alkenylthio, (C_2-C_4)-alkynylthio, halo-(C_2-C_4)-alkynylthio, (C_2-C_4)-alkylsulfinyl, halo-(C_2-C_4)-alkylsulfinyl, (C_2-C_4)-alkenylsulfinyl, halo-(C_2-C_4)-alkenylsulfinyl, (C_2-C_4)-alkynylsulfinyl, halo-(C_2-C_4)-alkynylsulfinyl, (C_1-C_4)-alkylsulfonyl, halo-(C_1-C_4)-alkylsulfonyl, (C_2-C_4)-alkenylsulfonyl, halo-(C_2-C_4)-alkenylsulfonyl, (C_2-C_4)-alkynylsulfonyl, halo-(C_2-C_4)-alkynylsulfonyl, cyano, cyanato, thiocyanato, halogen or phenylthio;

R^5 is hydrogen, tetrahydropyran-3-yl, tetrahydropyran-4-yl, tetrahydrothiopyran-3-yl, (C_1-C_4)-alkyl, (C_3-C_8)-cycloalkyl, (C_1-C_4)-alkoxy, (C_1-C_4)-alkoxy-(C_1-C_4)-

alkyl, (C_1-C_4)-alkylcarbonyl, (C_1-C_4)-alkoxycarbonyl, (C_1-C_4)-alkylthio, phenyl, the eight last-mentioned groups being substituted by v radicals selected from the group consisting of halogen, (C_1-C_4)-alkylthio and (C_1-C_4)-alkoxy, or

two radicals R^5 bonded to a joint carbon atom form a chain selected from the group consisting of OCH_2CH_2O, $OCH_2CH_2CH_2O$, SCH_2CH_2S and $SCH_2CH_2CH_2S$, this group being substituted by w methyl groups, or

two radicals R^5 bonded to directly adjacent carbon atoms, together with the carbon atoms to which they are attached, form a 3- to 6-membered ring which is substituted by w radicals selected from the group consisting of halogen, (C_1-C_4)-alkyl, (C_1-C_4)-alkylthio and (C_1-C_4)-alkoxy;

R^6 is (C_1-C_4)-alkyl, halogen, cyano or nitro;

R^7 is hydrogen, (C_1-C_4)-alkyl, halo-(C_1-C_4)-alkyl, (C_1-C_4)-alkoxy-(C_1-C_4)-alkyl, formyl, (C_1-C_4)-alkylcarbonyl, (C_1-C_4)-alkoxycarbonyl, (C_1-C_4)-alkylaminocarbonyl, di-(C_1-C_4)-alkylaminocarbonyl, (C_1-C_4)-alkylsulfonyl, halo-(C_1-C_4)-alkylsulfonyl, benzoyl or phenylsulfonyl, the two last-mentioned groups being substituted by v radicals selected from the group consisting of (C_1-C_4)-alkyl, halo-(C_1-C_4)-alkyl, (C_1-C_4)-alkoxy, halo-(C_1-C_4)-alkoxy, halogen, cyano and nitro;

R^8 is hydrogen, (C_1-C_4)-alkyl, (C_1-C_4)-alkoxy, (C_2-C_4)-alkenyl, (C_2-C_4)-alkynyl, (C_3-C_8)-cycloalkyl, aryl, aryl-(C_1-C_6)-alkyl, heteroaryl, heterocyclyl, halo-(C_1-C_4)-alkyl;

R^9 is hydrogen, (C_1-C_4)-alkyl, (C_2-C_4)-alkenyl, (C_2-C_4)-alkynyl, (C_3-C_9)-cycloalkyl, aryl, aryl-(C_1-C_6)-alkyl, heteroaryl, heterocyclyl, halo-(C_1-C_4)-alkyl, or, if R^8 and R^9 are bonded to one atom or to two directly adjacent atoms, they together with the atoms to which they are bonded form a saturated, partially or fully unsaturated five- to six-membered ring which contains p hetero atoms selected from the group consisting of oxygen, nitrogen and sulfur;

Y is a divalent unit selected from the group consisting of O, S, N-H, N-(C_1-C_4)-alkyl, CHR^5 and $C(R^5)_2$;

Z is a divalent unit selected from the group consisting of O, S, SO, SO_2, N-H, N-(C_1-C_4)-alkyl, CHR^5 and $C(R^5)_2$;

m and n are each 0, 1 or 2;

o, p and q are each 0 or 1;

such A2

w and x are each 0, 1, 2, 3 or 4;

v is 0, 1, 2 or 3.

2. A benzoylcyclohexanedione as claimed in claim 1, in which

X^1 is a divalent unit selected from the group consisting of O, S and NH;

R^1 is chlorine, bromine, fluorine, methyl, ethyl, cyano, nitro, halo-(C_1-C_2)-alkyl;

R^2 is halogen, halo-(C_1-C_4)-alkyl, (C_1-C_4)-alkylsulfenyl, (C_1-C_4)-alkylsulfinyl, (C_1-C_4)-alkylsulfonyl or nitro;

R^5 is (C_1-C_4)-alkyl, (C_3-C_8)-cycloalkyl, (C_1-C_4)-alkoxy, (C_1-C_4)-alkoxy-(C_1-C_4)-alkyl, (C_1-C_4)-alkylcarbonyl, (C_1-C_4)-alkoxycarbonyl, (C_1-C_4)-alkylthio, phenyl, or two radicals R^5 bonded to a joint carbon atom form a chain selected from the group consisting of OCH_2CH_2O, $OCH_2CH_2CH_2O$, SCH_2CH_2S and $SCH_2CH_2CH_2S$, this group being substituted by w methyl groups, or
two radicals R^5 bonded to directly adjacent carbon atoms form a bond or, together with the carbon atoms to which they are attached, form a 3- to 6-membered ring which is substituted by w radicals selected from the group consisting of halogen, (C_1-C_4)-alkyl, (C_1-C_4)-alkylthio and (C_1-C_4)-alkoxy;

R^8 is hydrogen, (C_1-C_4)-alkyl, (C_1-C_4)-alkoxy, (C_2-C_4)-alkenyl, (C_2-C_4)-alkynyl, (C_3-C_8)-cycloalkyl, aryl, aryl-(C_1-C_6)-alkyl, halo-(C_1-C_4)-alkyl;

R^9 is hydrogen, (C_1-C_4)-alkyl, or, if R^8 and R^9 are bonded to one atom or to two directly adjacent atoms, they together with the atoms to which they are bonded form a saturated, partially or fully unsaturated five- to six-membered ring which contains p hetero atoms selected from the group consisting of oxygen, nitrogen and sulfur.

3. A benzoylcyclohexanedione as claimed in claim 1, in which

X^2 is a straight-chain or branched (C_1-C_4)-alkylene, (C_2-C_4)-alkenylene or (C_2-C_4)-alkynylene chain, each of which is substituted by w halogen atoms;

R^3 is

a) hydrogen, hydroxyl, halogen, mercapto, amino, nitro, cyano, formyl,

b) phenyl, oxazolyl, furanyl or tetrahydropyrrolyl, each of which is substituted by w radicals selected from the group consisting of halogen, cyano, (C_1-C_4)-alkyl, halo-(C_1-C_4)-alkyl, (C_1-C_4)-alkoxy, halo-(C_1-C_4)-alkoxy, (C_1-C_4)-alkylthio, halo-(C_1-C_4)-alkylthio and R^{10},

c) $(R^{11})(C_1-C_4)$-alkylamino, $(R^{11})_2$-amino, R^{11}-oxycarbonyl, R^{11}-carbonyl, R^{11}-carbonyloxy; (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_6)-alkoxy-(C_1-C_6)-alkyl, (C_2-C_6)-alkynyloxy-(C_1-C_6)-alkyl, (C_3-C_9)-cycloalkyl, (C_3-C_9)-cyloalkenyl, (C_1-C_6)-alkoxy or (C_1-C_6)-alkylthio, each of which is substituted by v radicals selected from the group consisting of formyl, halogen, cyano, nitro, (C_1-C_4)-alkylamino, (C_1-C_4)-dialkylamino, (C_1-C_4)-alkoxycarbonyl, (C_1-C_4)-alkylcarbonyl, (C_1-C_4)-alkylcarbonyloxy, (C_1-C_4)-alkyl, (C_2-C_4)-alkenyl, (C_2-C_4)-alkynyl, halo-(C_1-C_4)-alkyl, (C_1-C_4)-alkylthio, halo-(C_1-C_4)-alkylthio, (C_1-C_4)-alkoxy and halo-(C_1-C_4)-alkoxy;

d) a radical of the formula Va, Vb, Vc, Vd, Vj or Vp, or

e) if p is zero, oxo, NR^8, N-OR^8 or N-NR^8R^9;

R^7 is hydrogen, (C_1-C_4)-alkylsulfonyl, benzoyl or phenylsulfonyl, the two last-mentioned groups being substituted by v radicals selected from the group consisting of (C_1-C_2)-alkyl, halo-(C_1-C_2)-alkyl, (C_1-C_2)-alkoxy, halo-(C_1-C_2)-alkoxy, halogen, cyano and nitro, and

R^{11} is hydrogen, (C_1-C_4)-alkyl, (C_2-C_4)-alkenyl, (C_2-C_4)-alkynyl or (C_3-C_8)-cycloalkyl.

4. A benzoylcyclohexanedione as claimed in claim 1, in which

X^1 is the divalent unit O;

R^4 is OR^7, (C_1-C_4)-alkylthio, (C_2-C_4)-alkenylthio, (C_1-C_4)-alkylsulfonyl, cyano, cyanato, thiocyanato, or else phenylthio which is substituted by v radicals selected from the group consisting of halogen, (C_1-C_2)-alkyl, (C_1-C_2)-alkoxy, halo-(C_1-C_2)-alkyl, halo-(C_1-C_2)-alkoxy and nitro;

R^5 is hydrogen, (C_1-C_4)-alkyl, (C_3-C_8)-cycloalkyl, (C_1-C_4)-alkoxy, (C_1-C_4)-alkylthio, phenyl, or two radicals R^5 bonded to directly adjacent carbon atoms, together with the carbon atoms to which they are bonded, form a substituted 3- to 6-membered ring;

R^{12} is hydrogen, (C_1-C_4)-alkyl, (C_2-C_4)-alkenyl, or, if R^{11} and R^{12} are bonded to one atom or to two directly adjacent atoms, they together with the atoms to which they are bonded form a saturated, partially or fully unsaturated five- to six-membered ring which contains p hetero atoms selected from the group consisting of oxygen, nitrogen and sulfur;

Y is a divalent unit selected from the group consisting of CHR^5 and $C(R^5)_2$, and

Z is a divalent unit selected from the group consisting of O, S, SO_2, N-(C_1-C_4)-alkyl, CHR^5 and $C(R^5)_2$.

5. A benzoylcyclohexanedione as claimed in claim 1, in which

R^2 is halogen, halo-(C_1-C_2)-alkyl or (C_1-C_2)-alkylsulfonyl;

R^5 is (C_1-C_4)-alkyl, (C_3-C_8)-cycloalkyl, (C_1-C_4)-alkoxy, (C_1-C_4)-alkylthio, phenyl, or two radicals R^5 bonded to directly adjacent carbon atoms together with the carbon atoms to which they are attached form a substituted 3- to 6-membered ring;

R^7 is hydrogen, (C_1-C_4)-alkylsulfonyl, benzoyl or phenylsulfonyl, and

R^8 is hydrogen, methyl or ethyl, and

R^2 is in the 4-position of the phenyl ring.

6. A benzoylcyclohexanedione as claimed in claim 1, in which

X^2 is a straight-chain or branched (C_1-C_4)-alkylene, (C_2-C_4)-alkenylene or (C_2-C_4)-alkynylene chain;

R^1 is chlorine, bromine, methyl, trifluoromethyl, cyano or nitro;

R^2 is chlorine, bromine, methylsulfonyl, ethylsulfonyl, trifluoromethyl or nitro;

R^4 is OR^7, (C_1-C_4)-alkylthio, (C_2-C_4)-alkenylthio or phenylthio;

R^5 is hydrogen, (C_1-C_4)-alkyl, or two radicals R^5 bonded to directly adjacent carbon atoms together with the carbon atoms to which they are attached form a substituted 3- to 6-membered ring;

A is a divalent unit selected from the group consisting of O, $S(O)_n$, NH and N-(C_1-C_6)-alkyl;

M is (C_1-C_6)-alkylene;

Y and Z independently of one another are a divalent unit selected from the group consisting of CHR^5 and $C(R^5)_2$.

7. A herbicidal composition which comprises a herbicidally active content of at least one compound of the formula (I) as claimed in claim 1.

8. A herbicidal composition as claimed in claim 7 in mixture with formulation auxiliaries.

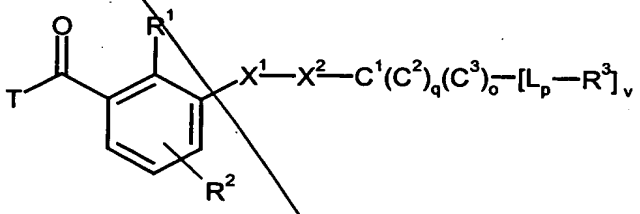
9. A method of controlling undesired plants, which comprises applying an effective amount of at least one compound of the formula (I) as claimed in claim 1 or of a herbicidal composition as claimed in claim 7 or 8 to the plants or to the site of the undesired plant growth.

10. The use of compounds of the formula (I) as claimed in claim 1 or of herbicidal compositions as claimed in claim 7 or 8 for controlling undesired plants.

11. The use as claimed in claim 10, wherein the compounds of the formula (I) are employed for controlling undesired plants in crops of useful plants.

12. The use as claimed in claim 11, wherein the useful plants are transgenic useful plants.

13. A compound of the formula (IIIa)



(IIIa)

in which T is (C_1-C_4)-alkoxy, hydroxyl or halogen and R^1, R^2, R^3, X^1, X^2, C^1, C^2, C^3, L, o, p, q and v have the meanings stated in claim 1, with the exception of compounds in which C^1 are oxiranyl or oxetanyl and the variable terms o and q are both simultaneously zero.